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No. 3711/37.

Complete Specification Accepted : Nov. 23, 1937.

## COMPLETE SPECIFICATION

**Improvements in Systems for Heating Buildings with Hot-air**

I, JAMES HENRY MAHER, a Subject of the King of Great Britain of 4, Granville Road, Hampstead, in the City of Montreal, Province of Quebec, Dominion of Canada, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

10 This invention relates to heating systems of the type in which a furnace has disposed thereabove a smoke-flue which passes upwardly through successive storeys of a building and in which an air-heating flue surrounds the smoke-flue throughout its length and is provided with openings which allow hot air to pass from said air-heating flue into the adjacent rooms of the building.

20 In a heating system of this type it has been suggested to provide several openings in the air-heating flue for a single room and to form these openings at various heights.

25 The present invention has for an object to provide an improved heating system of the type specified, and to this end and in accordance with the invention the air-heating flue surrounding the smoke-flue is provided at each storey with an upwardly directed air-inlet near the floor and an air-outlet near the ceiling.

The invention is illustrated by the accompanying drawings, in which—

35 Figure 1 is a vertical sectional view of the improved heating system, the plane of the section being in part substantially along the line 1—1 of Figure 2.

40 Figure 2 is a sectional view taken substantially along the line 2—2 of Figure 1.

Figure 3 is an enlarged vertical sectional view showing the construction of the smoke-flue and air-heating flue provided in accordance with the invention.

45 Figure 4 is a fragmentary transverse sectional view taken along the line 4—4 of Figure 1, certain elements that would otherwise appear in this figure being omitted for the sake of clearness.

50 Referring more particularly to the drawings, 5 designates a hot-air furnace provided with the usual air-heating chamber 6, fire box 7, grate 8, ash pit 9,

fire door 10 and ash door 11. Cold air is admitted to chamber 6 through an inlet 12 equipped with a suitable screen or filter 13 to exclude dust and other impurities.

The chamber 6 is formed between an outer casing 15 and an inner casing 16, the latter containing the fire box 7, grate 8 and ash pit 9. The smoke and products of combustion resulting from the burning of fuel on the grate 8 pass upwardly around a baffle 17 into the smoke box 18 and from thence to the smoke-flue or chimney 19. In the present instance the furnace 5 is shown located in the basement A of a house or other building and the smoke pipe 19 is arranged to extend vertically through the floors 20 and 21 of the upper stories B and C and through the roof D. The upper portion of flue 19 is reduced in diameter to provide a restricted portion 22 having its inception at a point slightly below the roof D. A suitable damper 23 is preferably arranged in the flue 19 at the lower end of the restricted portion 22.

The cold air admitted through inlet 12 is heated as it rises in chamber 6 to a dome 24 in which a substantial pressure is built up by the accumulation of heated air. A water pan 24a is arranged in chamber 6, as shown in Fig. 1, so that water contained in said pan is converted into steam and serves to humidify the heated air in chamber 6 and dome 24. The dome 24 is provided with restricted air outlets 25 and 26 the areas of which are suitably proportioned with reference to the cubical capacity of the dome so as to maintain a uniform pressure within the dome which is sufficient to force the heated air through outlets 25 and ducts 28 to portions of the building remote from the furnace 5 and the smoke-flue 19. The heated air discharged through outlets 26 is delivered to an air-heating flue 29 surrounding the smoke-flue 19. The flue 29 is also carried upwardly through the floors 20 and 21 and the roof D and has its upper portion restricted as indicated at 30. The upper portion of flue 29 is closed off by a plate 31 and a filling 32 of mineral wool or other heat insulating

[Price 1/-]

material which is tightly packed around the restricted portion 22 of the smoke-flue 19 between plate 31 and the chimney cap 31a.

At each of the floors B and C, the flue 29 is provided with hot-air outlets 34 and upwardly directed cool-air inlets 35. The relatively cool air adjacent each of the floors 21 and 22 is drawn into the heating flue 29 through the inlets 35 by the injector action of the flue heated air rising toward the outlets 34. This relatively cool air flows upwardly in heat interchanging relation with the smoke-flue 19 to the outlets 34 through which it is discharged along with the heated air that is supplied to the lower end of the flue 29 from storage space or dome 24. It will thus be seen that the air surrounding the flue 29 at each of the floors B and C is quickly and uniformly heated by rapid circulation thereof in contact with the smoke flue 19.

The circulation of air at each of the floors B and C is not necessarily confined to the immediate vicinity of the air-heating flue 29. In Fig. 1, I have shown a partition 37 provided with a hot-air passage 38 through which heated air, discharged through the outlets 34 of flue 29, is passed to the space at the side of the partition remote from said flue. I have also shown an air flow passage 39 through which relatively cool air is drawn past the partition 37 and into the inlets 35 of flue 29 for reheating and redistribution.

The restricted portion 22 retards the escape of the hot flue gases from the main portion of the smoke-flue 19 to such an extent that a relatively large proportion of the heat contained in these gases is utilized in heating the air contained in the surrounding air-heating flue 29. I have also found that, in practice, the amount of heat which the smoke and flue gases are caused to give up to the air circulating through the flue 29 may be greatly increased by appropriate setting of the damper 23 provided at the juncture of the main portion of the flue 19 with the restricted portion 22. When the damper 23 is arranged to engage the stop 23a the hot gases are retained in the main portion of flue 19 until practically all the heat contained in these gases has been transferred to the wall of the flue and to the air contained within the air-heating flue 29. It is also pointed out that the pressure built up in the main portion of the flue 19 is sufficient to force the relatively cool gases past the damper 23 and outwardly through the restricted portion 22 of the flue so that smoking of the furnace due to back draft is eliminated.

In the present instance I have disclosed a hot-air furnace of the coal burning type but it will be understood that my system lends itself to the use of furnaces designed for the consumption of other fuels, such as oil or gas. It will also be understood that the location and cross sectional contours of the flues 19 and 29 are not essential factors and may be varied to afford the best results in connection with each installation. In the particular installation described herein it will be noted that the flue 29 is octagonal in cross section and is arranged with its sides 29a engaging four partitions 40 by which the floor space B is divided to provide four adjoining rooms indicated at 41, 42, 43 and 44 in Fig. 4. Each of the remaining sides 29b of the flue 29 is provided with hot-air outlets 34 and cool-air outlets 35 serving one of the rooms 41.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. An air-heating system of the type specified wherein the air-heating flue surrounding the smoke-flue is provided at each storey with an upwardly directed air-inlet near the floor and an air-outlet near the ceiling.

2. An air-heating system according to Claim 1, in which the smoke-flue is provided with a restricted upper portion.

3. An air-heating system according to Claim 2, in which a damper is located at the juncture of the restricted portion with the main portion of the flue.

4. An air-heating system according to Claim 1, 2 or 3, wherein the upper end of the air-heating flue is at least partially closed.

5. An air-heating system according to any of the preceding Claims, wherein the lower end of the air-heating flue is connected to a hot-air storage dome situated immediately above the furnace.

6. An air-heating system according to any of the preceding Claims, wherein the air-outlet openings in the air-heating flue are shaped suitably to aid the flow of air from the latter into the adjacent room.

7. An air-heating system comprising a hot-air furnace provided with inner and outer casings affording an intervening air-heating chamber, said outer casing having an opening in its lower portion for the admission of cold air to said chamber and having its top portion formed to provide an upwardly extending dome or hot-air storage space communicating with the main portion of said chamber, a vertical smoke-flue having its lower end communicating with the fire box of the

furnace, a vertical air-heating flue surrounding said smoke-flue and having its lower end in communication with said storage dome, said air-heating flue being  
5 closed off at its upper end and being provided with a plurality of air-outlet and upwardly directed air-inlet openings arranged to serve different floor levels, said inlet and outlet openings being  
10 arranged to provide a cool air inlet and a hot air outlet for each floor level.

8. An air-heating system comprising a hot-air furnace including an air-heating chamber provided with a cold air inlet in  
15 the lower portion thereof, the upper portion of said chamber being formed to provide a storage dome in which the heated air rising from the lower portion of the air-heating chamber is accumulated  
20 to build up a substantial pressure, ducts through which heated air under pressure is forced to points remote from the

furnace, a smoke-flue extending upwardly from said furnace, an air-heating flue extending upwardly from said furnace  
25 and surrounding said smoke-flue and having its upper end closed off, the lower end of said air-heating flue being in communication with said dome through a  
30 restricted opening, said air flue being further provided, at intervals corresponding to different floor levels, with air-outlets and upwardly directed air-inlets arranged to provide an inlet and an outlet  
35 for each floor level.

9. The air-heating system shown in the accompanying drawing and described with reference thereto.

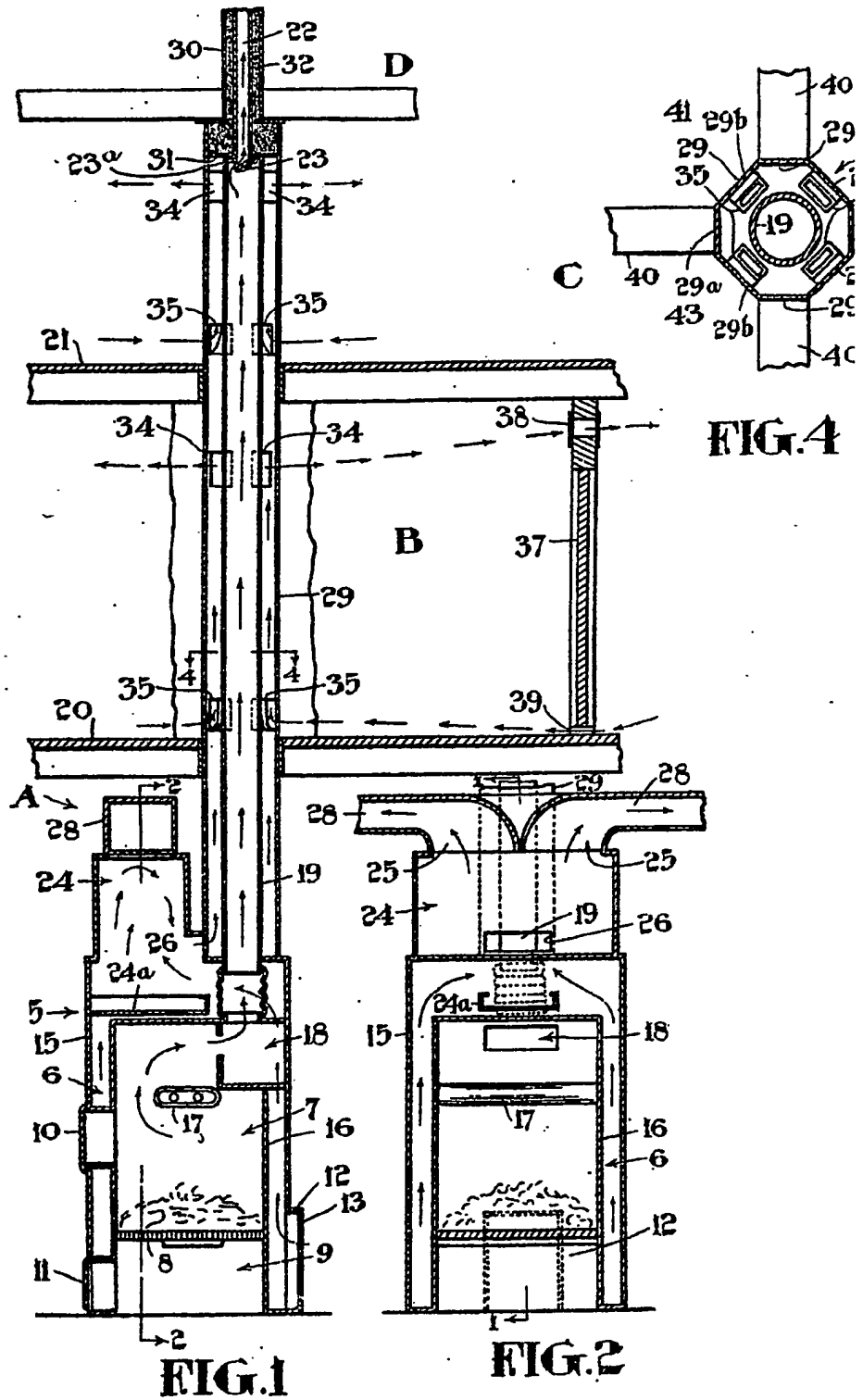
Dated this 8th day of February, 1937.

For the Applicant,

F. J. CLEVELAND & COMPANY,  
Chartered Patent Agents,  
29, Southampton Buildings,  
Chancery Lane, London, W.C.2.

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[This Drawing is a reproduction of the Original on a reduced scale.]



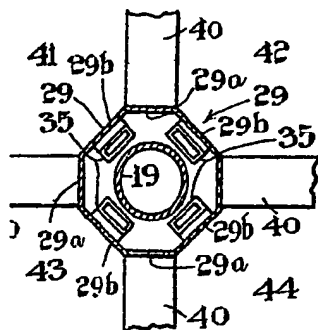


FIG. 4

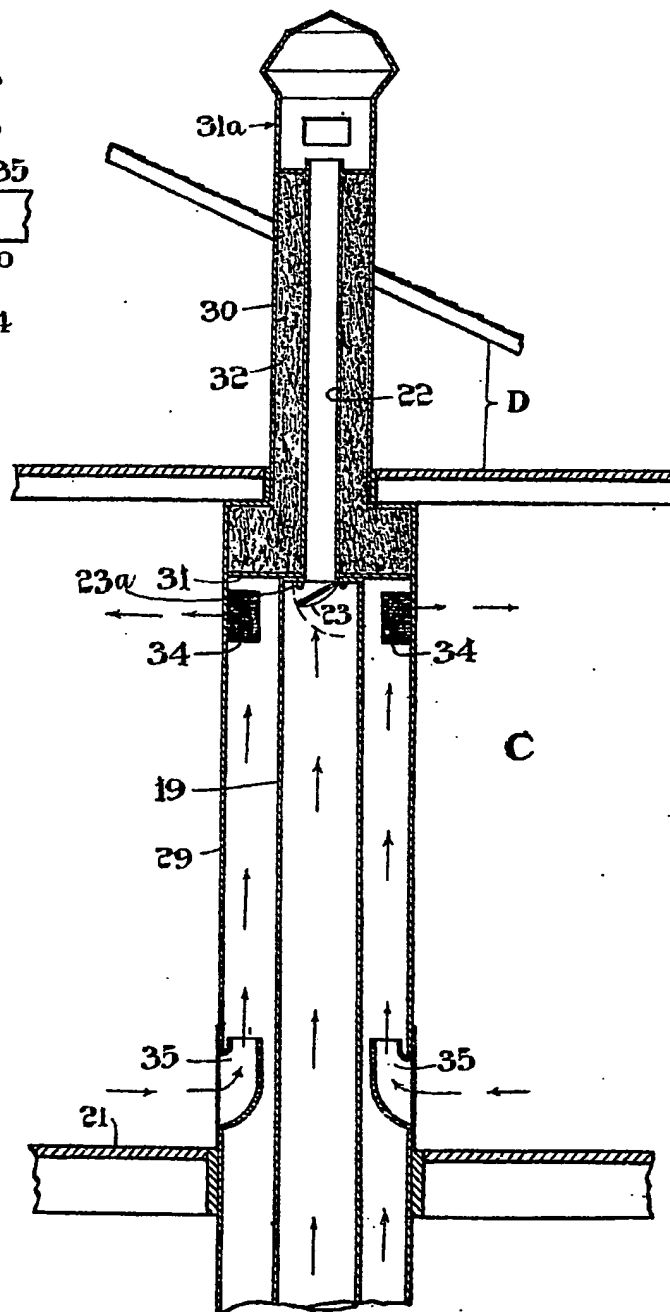


FIG. 3



5

6

8

5

3

12

475,615 COMPLETE SPECIFICATION

1 SHEET

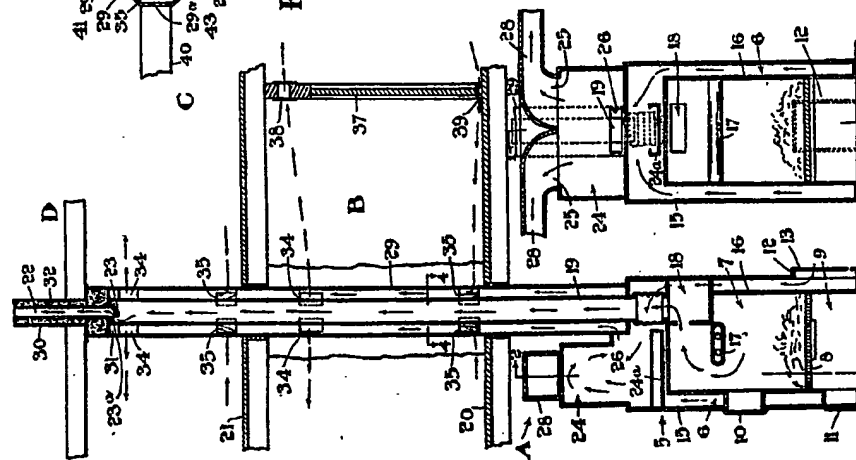


FIG. 1

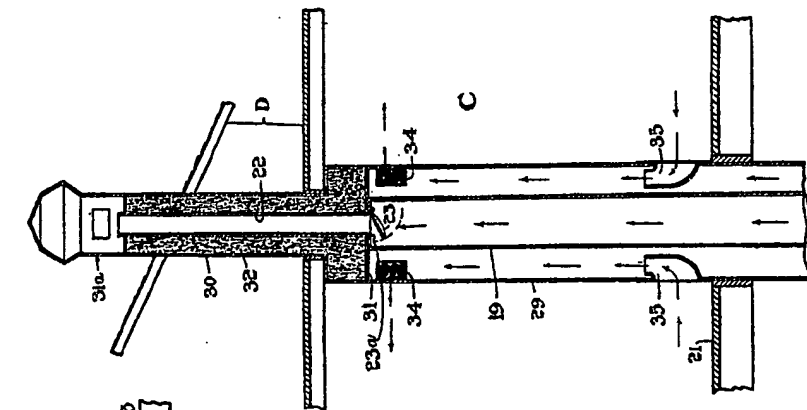


FIG. 2

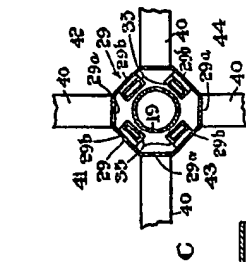


FIG. 3

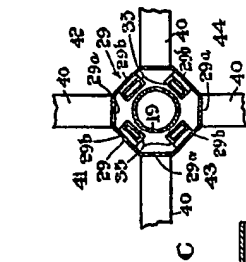


FIG. 4

[This Drawing is a reproduction of the Original on a reduced scale]

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